ASTR 310 - Observational Astronomy

Formula for Greenwich Sidereal Time

A formula relating the Greenwich mean (not apparent) sidereal time (GST) to the universal time (UT), good during a given year can be found on page B8 of the Astronomical Almanac. It looks like this:

$$GST = G + 0.0657098244 \times d + 1.00273791 \times t$$

where d is the day number during the year, t is the UT, and G is a constant for the year, actually just the GST at UT = 0^h on January 0 (= December 31 previous year!). Here are some values of G. Note how the progression jumps after 2000, 2004, and 2008, which are leap years:

		G	G		
Year		hours	h	m	s
1999		6.6147239	6	36	53.00
2000	*	6.5988098	6	35	55.72
2001		6.6486056	6	38	54.98
2002		6.6326915	6	37	57.69
2003		6.6167774	6	37	00.40
2004	*	6.6008633	6	36	03.11
2005		6.6506591	6	39	02.37
2006		6.6347450	6	38	05.08
2007		6.6188309	6	37	07.79
2008	*	6.6029168	6	36	10.50
2009		6.6527125	6	39	09.76
2010		6.6367984	6	38	12.47
2011		6.6208844	6	37	15.19

A little table of the accumulated days at the start of each month is useful for finding the day number d:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days	31	28	31	30	31	30	31	31	30	31	30	31
Accumulated	0	31	59	90	120	151	181	212	243	273	304	334
Days (* Leap Yr)	31	29	31	30	31	30	31	31	30	31	30	31
Accumulated	0	31	60	91	121	152	182	213	244	274	305	335

For example, if the date were October 3, 2001, and the UT were $6^h\ 30^m$, we would proceed as follows:

Since 2001 is not a leap year, we have $d = 273 + 3 = 276$. Then

$$GST = 6.6486056 + 0.0657098244 \times 276 + 1.00273791 \times 6.5 = 31.30231355$$

and, since the result exceeds 24^h, we subtract 24 to obtain

$$GST = 7.30231355 = 7^h\ 18^m\ 8.33^s$$